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present at the execution, and their report in writing, stating the nature of the examination made by them, shall be annexed to the certificate, signed by all the persons witnessing the execution, that the sentence was duly carried into effect in accordance with the requirements of the law. After the post-mortem examination, the body shall be delivered by the warden, for the purposes of dissection, to some public hospital or incorporated medical college within the State; or the body may be interred in the graveyard or cemetery attached to the prison, with a sufficient quantity of quicklime to promptly consume it. In no case shall the remains be delivered to any relative or friend; and no account of the details of any such execution, beyond the statement of the fact that the convict was, on the day in question, duly executed according to law at the prison, shall be published in any newspaper.

#### EXPLORATIONS IN THE DOMINION OF CANADA, 1886.

THE government of the Dominion of Canada, as well as those of the several provinces, are actively engaged in explorations and surveys, and a large amount of material is continuously being added to our knowledge of British North America. In the year 1886 work was in progress in all parts of the Dominion.

In British Columbia Mr. A. Bowman continued his explorations in the Cariboo district. He left Victoria on the 23d of June, accompanied by Mr. James McEvoy as geographical assistant, and on July 3 the party was ready to start into the field. While in 1885 the roads and trails were measured, and the centrally situated mountains were occupied as triangulation stations, geological researches being subordinate to geography, in 1886 great attention was paid to geology. The Goose Creek Mountains and the Selkirk Range, where there are no trails, were traversed with shoulder-packs, relying on the rifle to a considerable extent for supplies. A micrometer measurement of the great Quesnel Lake was carried out, with the aid of a large Chinese boat and an Indian canoe. Bear and Swamp River Mountains and the Dragon Creek Mountains were ascended with a single pack-horse, relying on the axe for progress, instead of a trail. The geographical work was completed by occupying with the transit all the necessary outlying stations, and by measuring with the steel tape two independent base-lines, which will be used as the foundation of the whole of the work.

Farther east, in the Rocky Mountains, Mr. R. G. McConnell has continued previous work in the vicinity of the Canadian Pacific Railway. Work was commenced on the 24th of May, at the gap of the Bow River, and during the course of the summer all the subordinate ranges lying between that point and Gold City were ascended and examined. Although the work was principally geological, our knowledge of the topography of the region was considerably increased, a number of sketches and cross-bearings having been taken from the summits of most of the mountains ascended.

In the district between the Bow and the North Saskatchewan Rivers, J. O. Tyrrell and D. B. Dowling were exploring. Here geology was also the prime object of the expedition; but incidentally the limits of prairie and wooded country in that district have been determined, and careful barometric readings have been taken at numerous points throughout the area examined, in order to lay down on the map approximate contour-lines.

A. C. Lawson continued his researches on the country east of the Lake of the Woods, principally mapping Rainy Lake and the adjacent territory. The main achievement of the season of 1886 was the connection of the township surveys on Rainy River by way of the Manitou canoe route with the Canadian Pacific Railway, and of the canoe route from Lake of the Woods to Rainy Lake.

Of great importance is A. P. Low's and J. M. Macoun's survey of Berens River and Deer Lake. On the 28th of May the mouth of Berens River, on Lake Winnipeg, was reached. Here, having purchased canoes, the season's work was commenced. From its mouth the Berens River was found to trend for one hundred and two miles south of east to Family Lake. Throughout this distance its course is broken by numerous small falls. At Family Lake the river bends sharply to the north, and the survey line runs in a slightly north-of-east direction to the height of land, passing through several lakes. Here the party reached Severn River by a short portage, and followed the stream in a north-east course. On

the 19th of June, Deer Lake, which was in part surveyed by Cochran in 1882, was reached. Descending its outlet for one hundred and seventy-five miles, another large lake was reached, the shores of which were covered with a fair growth of timber. This is called Favorable Lake. Following the river, running out of it for one hundred miles, a larger lake, called Sandy Lake, was entered. After one hundred and fifty miles more, Severn Lake was reached, whence the party proceeded to the Hudson Bay post on Trout Lake, and down Fawn and Severn Rivers to Fort Severn on Hudson Bay. The party then proceeded along the coast to York Factory, and returned, ascending the Hayes River route, to Norway House.

Another extensive journey was accomplished by Dr. Robert Bell. After a brief visit to Manitoulin Island, he went to Sault Ste. Marie, where he hired six *voyageurs* for his northern exploration. These, and the outfit of the expedition, were conveyed to Wabigoon Tank, on the Canadian Pacific Railway, and hence transported over a portage to Sandy Lake, from which the expedition was to start. Leaving the portage on the 6th of July, the general course of the route was north-eastward towards Cape Henrietta Maria, on Hudson Bay. The party first proceeded to Lonely Lake by way of Minnetakie Lake and its outlet. Having descended the upper part of the Albany River, Bell crossed the country northward to the Attawapishkat River, which he descended to the sea. Then he coasted southward on the west side of James Bay until the Albany River was reached. He ascended this river, and its tributary the Kenogamin River, to its source, whence he reached the Canadian Pacific Railway. The whole course from Long Lake to the junction of Albany and Kenogamin Rivers, with the exception of the coast of James Bay, was surveyed. The distances were ascertained by a boat's log, or by the time occupied in traversing them at a known speed, while the bearings were taken by compass. Observations for latitude were made almost every day, and the variation of the compass was also frequently ascertained.

The following part of Dr. Bell's description of his journey is of general interest, as it contains much new information:—

"On arriving at the Attawapishkat, I left my stores and large canoe in charge of one man on an island which I called Nolin's Island, and proceeded with the other men to examine the upward course of the larger stream for some distance previous to descending it to the sea. At about eleven miles above Nolin's Island we reached the lowermost lake of the Attawapishkat, which, the Indians informed me, bears the same name as the river itself. It lies diagonally across the course of the river, and has a length of about nine miles from south-west to north-east by four miles from south-east to north-west. Two miles above Attawapishkat Lake we entered a beautiful lake of much larger size, which, having as yet no distinctive name, I propose to call Lake Lansdowne, in honor of the governor-general of the Dominion. This lake proved to measure about thirteen miles from south-east to north-west by about ten miles from south-west to north-east, and it is the largest sheet of water connected with the river. It contains many large islands, and is much indented with bays. The surrounding country is more or less undulating and hilly, and thus affords a pleasing contrast to the level and monotonous character of nearly all the rest of the region explored during the season. The commencement of the upward continuation of the Attawapishkat River is found in the south-western bay of Lake Lansdowne. This part of the river is described by the Indians as being broad, having, for the most part, a sluggish current, and expanding occasionally into small lakes.

"The Attawapishkat River proved to be somewhat smaller than the Albany, which is not far from the size of the Ottawa above the capital. It descends at an almost uniform rate all the way from Lake Lansdowne to the sea,—a distance of several hundreds of miles. In this distance we did not require to make a single portage, and, from the description of the river above the lake, it would appear to be navigable without portages almost to its source, which has probably an elevation of more than one thousand feet above the sea. Where it flows over the limestone country it is broader and shallower than in the higher parts of its course.

"The seacoast between the Attawapishkat and Albany Rivers is very low and uniform in outline, and without indentations. The water is so shallow that we could touch the bottom with our canoe-

paddles at from half a mile to one mile from the shore. In order to pass the bowldery reefs, which extend from the shore north of the Albany, we were obliged to go so far out from the land that the tops of the trees were barely visible at the highest places.

"A careful track-survey of the Albany was made from its mouth to The Forks, which, with that of the upper part, also made during this season, when plotted, will enable me to map the whole course of this river, an actual survey of the intermediate portion having been made by myself in 1870. This river possesses additional importance from the fact of its constituting part of the northern boundary of the Province of Ontario."

Dr. Bell's assistants, Messrs. Macmillan and Murray, made a track-survey of part of the Albany River, leaving Bell's party at the lowest point reached by him on the Albany River.

E. Coste completed, with the assistance of J. White, a map of the Madoc and Marmora region, Ontario. We can only mention the surveys of R. W. Ells in the Eastern Townships, near the boundary of Maine, and L. W. Bailey's and R. Chalmers's work in New Brunswick.

Of no less importance are the surveys of the technical branch of the Department of the Interior, under the direction of the surveyor-general, Capt. E. Deville. A number of surveys were made near the Canadian Pacific Railway. Otto J. Klotz was put in charge of the survey of the Canadian Pacific Railway from the summit of the Rocky Mountains to Revelstoke on the Columbia River. In his report will be found an interesting table of elevations of mountain-peaks and a description of the country adjacent to that part of the railway. William Ogilvie was engaged in astronomical observations for determining the longitude of Kamloops. J. J. McArthur made an important topographical survey of those regions adjacent to the Pacific Railway which were not explored by Dr. G. M. Dawson on his reconnaissances of the Rocky Mountains. Fred. W. Wilkins was put in charge of an exploratory survey of Lake Winnipeg, of which he made a complete circuit. He gives the length of the lake as two hundred and seventy miles, its width ranging from two to sixty miles. He describes the lake as shallow, rough, and stormy, and navigation as extremely difficult and dangerous. The east coast is studded with reefs, rocks, and rocky shoals. The west coast, though having deep water in some places, is also very shallow, but its coasts are sandy and muddy. Besides this, numerous township and road surveys were made.

In 1885 the country adjacent to the Banff Hot Springs on the Pacific Railway was reserved for public use, and during the last year it has been surveyed, and roads are constructing which will make accessible the numerous sights of this Canadian National Park. In addition to the reservations at Banff, four mountain parks were reserved in 1886,—Mount Stephen and its environment, Mount Sir Donald, taking in the famous loop of the railway, Eagle Pass, and the amphitheatre at the summit of the Selkirk Mountains.

The Department of Marine was not less active in exploring the little-known parts of the Dominion. We reported on the third Hudson Bay expedition, under Lieut. A. Gordon, in No. 252 of *Science*. Commander J. G. Boulton was actively engaged in carrying on his surveys in Georgian Bay and North Channel, the results of which are published in charts of the British Admiralty, and in the 'Georgian Bay and North Channel Pilot,' which contains much interesting information on those waters.

The Indian Department was engaged in surveying and laying out reserves for various tribes, but principally for those of British Columbia; and the descriptions of the reserve commissioners are of some interest.

The provincial government were busily engaged in extending the surveys of the crown lands. The reports and descriptions of the provincial land surveyors abound with information on the townships they surveyed and divided, and we can only point out a few of the more important reconnaissances of outlying regions. In the Province of Ontario, A. Niven surveyed the outlines of seven townships adjacent to Lake Temiscamingue, in the Nipissing district. He found nearly the whole of the outline to be good farming land, the country level and free from stone. Another reconnaissance was made between Rainy Lake and the 49th parallel, from which it appears that most of the country is rough and broken, with occasional valleys of good land.

In the Province of Quebec, W. A. Ashe made a survey of the Temiscamingue region, and his report on this country agrees with that of A. Niven, who surveyed those parts belonging to Ontario. C. E. Forgues visited the numerous streams emptying on the northern coast of the Gulf of St. Lawrence, and found that they yield a considerable amount of salmon.

The exploration and colonization of the outlying districts, which were considered of no value whatever a short time ago, are progressing rapidly. Railways and colonization roads are being built and pushed forward in all parts of the country, and the newly opened districts becoming rapidly settled.

As our knowledge of Canada makes rapid progress, so the science of geography has been gaining many friends, and geographical problems are discussed by many societies. It is the subject of many papers read before the Royal Society of Canada; and among them, Capt. E. Deville's paper on the best projection for maps of the Dominion of Canada takes a prominent place. The Geographical Society of Quebec publishes in its Transactions a considerable amount of interesting information, and the associations of the Dominion Land Surveyors and those of the Provincial Land Surveyors of Ontario discuss many matters of geographical interest in their annual reports.

DR. F. BOAS.

## MENTAL SCIENCE.

### What the Will Effects.

UNDER this head Professor James (*Scribner's Magazine*, February, 1888) discusses the processes of voluntary action from the point of view of the 'new psychology.' The discussion is in so many respects characteristic of the rejuvenating interest with which this point of view invests the topics that have always occupied the thoughts of reflecting people, that a somewhat full account of the article will be given below, in the hope of inducing those interested in this science to read the original.

The point of advance in the 'new psychology' of the will that Professor James regards as of most value is its reference of all activity to the type of reflex action. The steps between the application of the stimulus and the accomplishment of the re-action may be short and simple, or they may be long and intricate. I may wink instantaneously at a threatened blow, or I may take a long time in deliberating how to act upon the receipt of a momentous letter. In either case the psychic process, which in the most highly developed form becomes conscious thought, is regarded as a means towards an end,—the action, the conduct. Life is an adjustment to the environment, and the new environment is ever developing in complexity and variability of the adjustments that it makes necessary. A certain kind of these adjustments are usually singled out for separate treatment under the term 'voluntary actions;' but the doctrine now generally accepted is that this class of acts has been evolved from the involuntary acts. The distinction is one of degree of complexity and other characteristics, important among which is the characteristic that in the voluntary action the act is foreseen, the 'idea precedes its execution, while in the involuntary mode of action the act, though perhaps foreseen as a result of remembered experience, takes place not in obedience to this foresight, but "we know what we are going to do only after we have done it." From this it follows that no act can be voluntary the first time it is performed. "Until we have done it at least once, we can have no idea of what sort of a thing it is like, and do not know in what direction to set our will to bring it about." If one attempts to move his ear, the great difficulty is to know what sort of an effort to make, and what is lacking is the remembrance of the feeling of a moving ear. This is the mental material out of which the motion is generated, and the way to proceed is to move the ear passively until we have a tolerably clear idea of the feeling of the ear when it moves, and then attempt to reproduce this feeling. We teach children to write by holding their hands in the proper position, until they know how it feels; and so, in general, unless we have a guide to direct us in the kind of effort we ought to make to secure the desired end, we must more or less trust to a chance success. There is no abstract willing into the void, and without a memory there could be no will. All our most elaborate acts of will depend for their execution on certain physiological co-ordinations, which, in